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REPORT

CD NO.

50X1-HUM

COUNTRY USSR - Estonian SSR, Latvian SSR
 SUBJECT Economic - Ferrous Metallurgy
 HOW PUBLISHED Daily newspapers
 WHERE PUBLISHED Tallin; Riga
 DATE PUBLISHED 30 Jun, 6 Jul 1951
 LANGUAGE Russian

DATE OF INFORMATION 1950 - 1951

DATE DIST. 18 Oct 1951

NO. OF PAGES 2

SUPPLEMENT TO REPORT NO.

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LATVIAN AND ESTONIAN PLANTS
SUBSTITUTE SHALE FOR FOUNDRY COKE

ESTONIAN PLANT USES SHALE IN CUPOLA FURNACE -- Tallin, Sovetskaya Estoniya,
 30 Jun 51

The question of complete or partial replacement of foundry coke by a cheaper and more plentiful kind of fuel has long occupied the minds of metallurgists. However, until recently all research in this direction failed to give any noteworthy, positive results.

In July 1950, the foundry shop of the Tallin Machine-Building Plant first made experiments in smelting metal with the use of shale as fuel. At first, consumption of coke remained the same. It was important to determine how shale would behave in a cupola furnace. Having found out that it would burn, the amount of shale was gradually increased. It was found that shale does not hinder the smelting process and does not lower the temperature of the liquid pig iron, and that the slag remains fluid. Slag analyses showed that it contained up to 45 percent lime. The addition of limestone as a flux was discontinued, as it was completely replaced by fusible shale ash.

The amount of coke used as fuel was gradually diminished and it was partially replaced by shale. As a result, a new method of smelting pig iron in cupola furnaces was developed, using a mixture of foundry coke and bituminous shale. This method makes it possible to reduce the total consumption of coke 30-35 percent and to eliminate completely the use of limestone.

After a 10-month period of using shale as a fuel in smelting pig iron, it can be said that the problem of partially replacing coke by a cheaper fuel has been definitely solved.

There has been much skepticism in the past with regard to the use of shale as a substitute for coke. This may be explained by the fact that only those properties of shale were known which are apparent when shale is heated slowly, the procedure used in the shale-processing industry. In the refining of shale,

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the gasification process takes 12 hours, whereas the decomposition of shale in the cupola furnace takes only 20 minutes. Observations have shown that when the shale is dropped quickly into the furnace shaft, it does not soften but forms a hard crust on the surface, preventing the escape of volatile matter from the center portion of the lump of shale. The shale remains only a very short time in the preheating zone of the furnace charge; it therefore has time to dry out only partially and to liberate a certain amount of hydrogen sulfide and carbon dioxide. However, the bulk of volatile matter is burned in the zones which are relatively close to the smelting zone of the cupola furnace, where the main part of the heat is formed.

An effective use of shale in the cupola furnace depends on the size of shale lumps and the moisture content of shale. The foundry shop used pieces of shale measuring 150-250 millimeters, which had first been placed in a boiler with water. Wet shale reaches the smelting zone with hardly any decomposition and burns more effectively, without any smoke. The temperature of liquid pig iron released from the forehearth of the furnace was maintained at 1,380 to 1,390 degrees during the entire smelting period.

An analysis of the chemical composition, microstructure, and mechanical properties of pig iron smelted with a mixture of coke and shale shows that the qualities of the metal remain the same as in the case of pig iron smelted with coke alone.

With the new smelting method, the productivity of cupola furnaces is increased from $3\frac{1}{2}$ to $4\frac{1}{2}$ tons per hour. The partial substitution of shale for coke amounts to a saving of 21 rubles per ton of liquid iron.

The introduction of the new smelting technology with the use of shale opens up wide possibilities for saving foundry coke, which is in short supply. Deposits of bituminous shale are very large and the new method will probably find wide application in enterprises of the Estonian SSR and other USSR republics.

LATVIAN PLANT BEGINS USE OF SHALE -- Riga, Sovetskaya Latvija, 6 Jul 51

The "Baltijas rupniyek" Plant in the Latvian SSR has begun mass production of extra-strong cast iron, which is almost equal to steel in its properties. The plant is working on the improvement of technological production processes. Recently, the foundry shop began to use shale in smelting pig iron. This makes it possible to save daily almost 22 percent of the coke shipped from distant points.

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